UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF OHIO
WESTERN DIVISION

DAVID FERGUSON, et al.	:	File No. C-1-02-039
Plaintiffs,	:	Judge Weber
vs.	:	Magistrate Judge Hogan
RYDER AUTOMOTIVE CARRIER SERVICES, INC., et al.	:	DEFENDANT HANES SUPPLY, INC.'S REPLY IN SUPPORT OF ITS MOTION TO EXCLUDE THE TESTIMONY OF PLAINTIFFS' EXPERT WITNESS GABRIEL ALEXANDER
Defendants.	:	

That Plaintiff's expert witness can be cross examined does not cure the fact that his testimony does not meet the rigorous standards of admissibility set by the Supreme Court in *Daubert v. Merrill Dow Pharmaceuticals, Inc.*, 509 U.S. 529 (1993). Mr. Alexander condemns the use of galvanized steel, when the texts on which he relies actually recommend galvanized steel for use outdoors or in corrosive environments. There is no peer review of his hypotheses. There is no testing to support his conclusions. He simply lacks all the necessary ingredients of an expert in this case.

ARGUMENT

I. Mr. Alexander's lack of qualifications.

Hanes Supply does not deny that Mr. Alexander has testified a great number of times. But, testifying in other cases does not make Mr. Alexander qualified to testify in this case. This is his first time testifying about wire rope. (Ex. A, Alexander depo. at 11). He has no pertinent

experience in wire rope, has done no testing of wire rope, and has never published on the subject of wire rope. (Id. at 11, 96; Ex. B, Alexander Report, Curriculum Vitae).

The strongest evidence of Mr. Alexander's inexperience is that he acknowledges galvanizing is used to protect from corrosion and that the authorities he cites specifically recommend galvanized wire rope where corrosion protection is needed. (Ex. A, Alexander depo. at 92-93.) Mr. Alexander simply lacks the specialized knowledge required of an expert witness in this case.

II. Mr. Alexander conducts no testing to support his opinions.

If an expert's testimony lacks support from the research of others, it should have empirical support of its own. Mr. Alexander's testimony has neither. Plaintiffs' argument that no testing of Mr. Alexander's position is required even though he contradicts the technical literature on which he relies is entirely implausible.

Plaintiffs are also incorrect to suggest that testing was impossible because only "actual testing and use of the material over an extended period of time" could reveal its life span.[1/] (See Plaintiffs' *Memorandum in Opposition*, Doc. 110, at 4). On the contrary, Mr. Alexander acknowledges that a salt spray cabinet, which accelerates corrosion for purposes of testing a material's lifespan, could have been used to test the corrosion of this wire rope cable. (Alexander depo. at 41, 85). He did not use one. (*Id.*)

1/ This is an irony. One of Mr. Alexander's claims is that the product liability defendants put the cables into use without sufficient testing. (Ex. B, Alexander Report at 34). Now the Plaintiffs claim that no testing could have been done.

The examination of the exemplar cable cannot justify Mr. Alexander's conclusions. While Hanes Supply respectfully disagrees that the actual and exemplar cables resemble one another, the Plaintiffs miss the point. The question is not whether the exemplar resembles the actual item. The issue is whether reliable conclusions can be drawn from a cable whose history is unknown. And they can't. The parties know nothing about the exemplar; its work history could be entirely different from the actual cable. Perhaps the exemplar is one of the intact cables that was removed by Allied and then cut up to prevent its reuse. The rust on the exemplar could have occurred after removal, while it sat on a shelf or outside for a few years before it made its way to Plaintiffs' counsel. Without the cable's history, no reliable conclusions can be drawn from the exemplar.

Plaintiffs also miss the point concerning Mr. Alexander's discussion of "stress concentration factors." His analysis contains miscalculations, which shows Mr. Alexander's inexperience with wire rope. But also, stress concentration factors relate to a material's strength, not its propensity to corrode. (Ex. B, Alexander Report at 32). Thus, in the words of *Daubert*, there is no "fit" between the issues of this case and the science Mr. Alexander proposes to use.

III. Even if Mr. Alexander's credibility can be attacked, his testimony must still meet the standards of admissibility before it is admitted.

The reason Mr. Alexander lacks the critical indicia of reliability set forth in *Daubert* is because his testimony is unreliable and inadmissible. It bears repeating that despite condemning the use of galvanized wire rope, Alexander admits that galvanizing is used to protect metal in corrosive environments (Ex. A, Alexander depo. at 92) and that galvanized cable is the norm for outdoor environments. (Ex. B, Alexander Report at 17). The technical documents concerning

wire rope cited in the Alexander Report utterly reject the suggestion that galvanized rope should not be used in outdoor applications. (*Id.*) There is no peer review of Mr. Alexander's position and contrary to Plaintiffs' suggestion, an opposing party is not obligated to provide it.

Likewise, no amount of context can make the numerous irrelevant and illogical observations made by Mr. Alexander helpful to the jury. Concluding that design changes equate to defects in prior designs is nonsense. Discussing Hanes Supply's duties under the Highway Safety Act is nonsense; Hanes Supply is not a motor carrier. Discussing galvanized cable's suitability in airplanes has no place in this case. Mr. Alexander's testimony is utterly unreliable and it will not assist the trier of fact.

IV. The exemplar is unreliable and lacks a foundation, making any testimony relying on it unreliable.

Reliable scientific analysis requires that unknown factors be controlled in a disciplined and scientific way. Mr. Alexander turns a blind eye to the unknown and draws conclusions for his client, ignoring the irrefutable fact that the break in the exemplar is not between the plastic and the swage like the actual cable. He also ignores those witnesses who warn that the exemplar's break is not consistent with other broken cables. These facts show why there must first be a foundation for the exemplar before it can be relied on in an reasonable scientific inquiry.

Even if the exemplar is the "best evidence" that the Plaintiffs have, it is not good enough. No one, including Mr. Alexander, can tell the Court or the jury why the exemplar failed, or whether it failed in the same way as the actual cable. What was the work history of the exemplar? Was it an intact cable that was cut during Allied's replacement program to prevent its use? Did it

rust in service or rust on the shelf? How old is it? Was it ever damaged in an accident? Nobody knows. Drawing conclusions without knowing these answers is reckless. The Court should not endorse Mr. Alexander's cowboy approach to science by permitting his testimony. Such unreliable testimony has no place in this case.[2/]

IV. The Court's "gate keeper" duties dictate that Mr. Alexander's testimony be excluded.

The lack of experience, lack of testing, lack of peer review, lack of "fit," combine with the lack of support in any technical literature to show the unreliability of Mr. Alexander's testimony. Mr. Alexander ignores all the evidence and science as he charges to the predetermined conclusion reflected in his Report. Mr. Alexander's testimony will not be useful to the finder of fact and should be excluded.

Respectfully submitted,

Craig R Paulus (074352)
Taft, Stettinius & Hollister LLP
425 Walnut Street, Suite 1800
Cincinnati, OH 45202-3957
513.381.2838
fax 513.381.0205
Trial Attorney for Defendant
Hanes Supply, Inc.

2/ It is irrelevant that without the actual cable, the Plaintiffs may have difficulty proving their case. Hanes Supply is aware of no authority that permits an inference based on spoliation to support the use of unreliable scientific examination. Even if such authority existed, there is no basis for imposing a spoliation sanction on Hanes Supply.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and accurate copy of the foregoing was electronically filed with the Southern District of Ohio on September 30, 2003. Notice of this filing will be sent automatically to the following parties by operation of the Court's electronic filing system.

Thomas Ralph Koustmer
1800 Federated Building
7 West Seventh Street
Cincinnati, OH 45202
513.621.3616
Attorney For Plaintiffs, David and Martha Ferguson

David E. Larson
Larson & Larson PC
11300 Tomahawk Creek Parkway
Suite 310
Leawood, KS 66211
Attorney for Defendants, Ryder Automotive Carrier Services, Inc.; Ryder System Inc.; Delavan Industries, Inc.; Ryder Automotive Operations, Inc.; Ryder Automotive Carrier Group, Inc.; and Commercial Carriers, Inc.

Kenneth Roger Schoeni
Kohnen & Patton
441 Vine Street
Suite 1400
Cincinnati, OH 45202
513.381.0656
Attorney For Defendants, Ryder Automotive Carrier Services, Inc.; Ryder System Inc.; Delavan Industries, Inc.; Ryder Automotive Operations, Inc.; Ryder Automotive Carrier Group, Inc.; and Commercial Carriers, Inc.

Michael J. Honerlaw
Honerlaw and Honerlaw Co. L.P.A.
9227 Winton Road
Cincinnati, OH 45231
Attorney For Plaintiffs, David and Martha Ferguson

Served by Regular Mail:

Robert Albert Winter, Jr.
Hemmer Spoor Pangburn DeFrank PLLC
250 Grandview Drive
Suite 200
Ft. Mitchell, KY 41017
859.344.1188
Attorney For Defendants, Allied Systems and Allied Automotive Group

Exhibit A

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF OHIO
WESTERN DIVISION

- - - -

DAVID FERGUSON, et al.,

Plaintiffs,

-vs-

COMMERCIAL CARRIERS, INC., et al.,

Defendants.

Case No. C-1-02 039

- - - -

DEPOSITION OF: GABRIEL ALEXANDER

- - - -

DATE: May 13, 2003
Tuesday, 10:08 a.m.

LOCATION: Embassy Suites
550 Cherrington Parkway
Coraopolis, PA 15108

TAKEN BY: Defendant
Commercial Carriers, Inc.

REPORTED BY: Renee' Neely
Notary Public
NMR Reference No. 051303

CERTIFIED COPY

- - - -

BY MR. LARSON:

Q. Of the cases which you have served in the capacity as an expert witness, whether you have given deposition or trial testimony notwithstanding, other than the Ferguson case, have any of those cases dealt specifically with the issue of the design of a system that includes cable or wire rope?

A. Not specifically to -- none that I recall that are specific to wire rope. But, again, many of my depositions and cases in general are falls from vehicles, and the design principals are very similar.

Q. Well, I appreciate that, but insofar as the specific issues of material selection for what is or isn't an appropriate selection of a wire rope or cable, is this the first case in which you've specifically addressed that issue?

A. That's correct.

Q. All right. Now, have you ever been involved in cases other than this one in which you sought out, for whatever reason, a metallurgical evaluation of any particular product or component?

Q. I believe the test was over 7,000 pounds per quarter-inch galvanized aircraft cable; is that correct?
A. That's correct.
Q. So as the diameter of the cable diminishes as there's corrosion, couldn't hydrogen embrittlement become a factor in the failure?
A. I can't answer that. I'm not sure. Once it starts to fail -- I can't answer that.
Q. Why don't you explain for the record the difference between bright wire, galvanized wire and stainless steel wire.
A. Stainless steel wire is stainless steel.
Q. Okay. How about bright wire?
A. Bright wire is more like a polished, you know, uncoated steel.
Q. Okay.
A. And galvanized steel is a coated wire.
Q. What is the purpose of -- what is the coating on galvanized steel?
A. It's basically zinc, zinc coating, nickel zinc, I think.
Q. What's the purpose of the zinc coating?
A. It's a protective coating.
Q. What does it protect the metal from?

Exhibit B

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF OHIO
WESTERN DIVISION

DAVID FERGUSON, et al.,

Plaintiffs,

vs.

RYDER AUTOMOTIVE CARRIER SERVICES, INC., et al.,

Defendants.

Case No. C-1-02 039

(Judge Herman J. Weber)

PLAINTIFF'S DISCLOSURE PURSUANT TO RULE 26(B) FEDERAL RULES OF CIVIL PROCEDURE

Now comes Plaintiff, David Ferguson, by and through the undersigned counsel and hereby discloses expert's report pursuant to Federal Rule 26(B) attached hereto.

Thomas R. Koustmer, Esq.
Attorney for Plaintiff
1800 Federated Building
7 West Seventh Street
Cincinnati, Ohio 45202

Michael J. Honerlaw, Esq.
Attorney for Plaintiff
Honerlaw & Honerlaw Co., L.P.A.
9227 Winton Road
Cincinnati, Ohio 45231

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing was delivered via U.S. Mail on March 24, 2003 to the following:

Robert Albert Winter, Jr.
Hemmer Spoor Pangburn DeFrank &
Kasson PLLC
250 Grandview Dr., Suite 200

Ft. Mitchell, KY 41017
(859) 344-1188

David E. Larson
Larson & Larson PC
11300 Tomahawk Creek Parkway, Suite 310
Leawood, KS 66211
Attorney for Defendants Ryder System Inc.,
And Commercial Carriers, Inc.

Craig R. Paulus, Esq.
Taft, Stettinius & Hollister LLP
425 Walnut St., Suite 1800
Cincinnati, Ohio 45202-3957
Attorney for Defendant Hanes Supply, Inc.

Thomas R. Koustmer
Attorney for Plaintiff

PRELIMINARY REPORT

of the

FERGUSON INCIDENT

Prepared By:

Gabriel G. Alexander P.E.

March 24, 2003

FERGUSON INCIDENT REPORT

ENGINEER'S REPORT **MARCH 24, 2003**

A. INTRODUCTION

This fall incident occurred on September 7, 2000 at about 10:15 AM at the Allied Systems facility in Moraine, Montgomery County, OH. The incident involved a 1995 Volvo WRGH64 tractor manufactured into an auto transporter by Commercial Carriers, Inc. (CCI) operated by David Ferguson.

Ferguson was in the process of loading the auto transporter and was working in the area above the cab on the driver's side when the incident occurred. Allied Systems Inc employed Ferguson at the time of the incident as a driver.

Post incident inspection of the vehicle revealed that the lower safety cable above the cab on the driver's side had failed.

This investigation was performed to determine if the vehicle and its maintenance were defective in a manner that was a cause of this incident.

I am a full time salaried employee of Robson Lapina. Robson Lapina Charges $ 275 per hour for my time.

B. INFORMATION AVAILABLE FOR REVIEW

1) Deposition of David Ferguson dated 11/21/2002.

2) Deposition of William C Hanes dated 2/12/2003.

3) Deposition of Gary Owen Chinn dated 2/20/2003.

4) Deposition of Richard H. Shivley dated 2/20/2003.

5) Deposition of William C. Weaver dated 2/20/2003.

6) Deposition of Peter J. Terzian, Jr. dated 2/11/2003.

7) Deposition of Frederick L. Wolf dated 2/20/2003.

8) 149 Photographs of the incident and exemplar vehicles.

9) 2 exemplar cables.

10) My inspection and photographs of the exemplar cables.

11) Discovery provided by Allied Systems Inc.

12) Discovery provided by Commercial Carriers, Inc.

13) Discovery provided by Hanes Supply, Inc.

14)Photographs of the scene and vehicle.

15) BWC Incident Report.

C. DESCRIPTION OF THE INCIDENT

The BWC Report States:

> I was loading a vehicle on the top deck head ramp. I was on my knees hooking a chain and when I started to get up I put my left hand on the safety cable and it snapped causing me to fall to the ground.

D. VEHICLE DESCRIPTION

Incident Vehicle

The incident vehicle was a 1995 Volvo tractor that was manufactured into an auto transporter by CCI. The tractor was Allied unit 61304. The trailer was Allied unit 71304.

The tractor a Volvo model WRH64 had the following VIN 4V2PBPF5SR707229.

The auto transporter is a CCI Model 55-2878, Quick 12. The standing surface of the top deck head ramp is about 8 feet 2 inches from the ground.

According to CCI interrogatory answers there is neither an owner's nor is there any maintenance manual for the incident truck and trailer.

CCI drawings indicate that the vehicle was equipped with a total of four safety cables for the top deck head ramp with two mounted on each side. CCI drawing 100340 titled SAFETY CABLE, Attachment A, and reveals the specification for the safety cables they supply with the vehicle. The CCI drawing specifies stud threaded aircraft fittings for their safety cable. The CCI drawing also specifies 1/4 to 5/16 x 7x 19 GAC yellow coated cable. Hanes Supply Inc supplied the cables CCI that were utilized by CCI.

Attachment B is a Hanes Supply invoice which calls for a similar specification of ¼" 7x19 GAC cable coated yellow to 5/16".

Photographs 1 through 46 are various views of the incident and exemplar units as well as exemplar cables. Photographs 1 through 21 and Photographs 45 and 46 were provided.

Photographs 1 through 5 are various views of the incident vehicle and cable taken shortly after the incident. Photograph 1 is a view of the vehicle head ramp and reveals the location of the failed safety cable. The red arrows in Photographs 1 through 5 identify the separated cable and the blue arrows identify the swage fitting the cable separated from.

As can be seen from Photographs 1 through 5, 45 and 46 at the time of the incident there were three safety cables that utilized thimble and eyebolt connections at the ends of the cable. Further, there was one safety cable that utilized stud threaded aircraft fittings that were swaged to the cable.

Photograph 6 through 15 are various views of the incident unit taken about 9/19/2002. Photograph 6 is an overall view of the incident vehicle as viewed from the front right. Photograph 7 is a close-up of the incident cab as viewed from the front left and reveals the incident top deck head ramp.

Photograph 8 is a close-up view of the safety cables above the cab on the driver's side.

Photograph 9 is a view of the vehicles VIN data plate. Photograph 10 is a close-up view of the unit just above the cab on the driver's side and reveals the unit number and CCI model number.

Photograph 11 is a close-up view of a typical safety cable attachment. At the time of this inspection all four safety cables were of the thimble and eyebolt cable connection design.

Photographs 12 and 13 are close-up views of the safety cables and reveal the height of the cables from the top deck head ramp. Further, as can be seen from Photographs 11 through 13 the cables are coated with a clear material and that the cables are not rusty.

Photographs 14 and 15 are close up views of the top deck head ramp's walking surface and reveals the presence of black slip resistant paint.

Exemplar Vehicle

Photographs 16 through 21 are various views of an exemplar auto transporter. Photographs 17 through 21 reveal that there were three safety cables that utilized thimble and eye bolt connections at the ends of the cable. Further, there was one safety cable that utilized stud threaded aircraft fittings that were swaged to the cable. As can

be seen from Photographs 20 and 21 the cable with the stud threaded aircraft fitting is coated with a clear material and that the cables are not rusty. The cable and fitting appear to be made of stainless steel with non-stainless hardware.

First Exemplar Cable

Photographs 22 through 44 are various views of two exemplar cables that I inspected.

The first cable is documented in Photographs 22 through 38. Photographs 22 through 24 reveal that the cable is failed at one end where it would mate with the swaged fitting. This cable is consistent with the CCI/Hanes specification. Further, the failure of the exemplar cable is consistent with the failure of the incident cable.

Photographs 26 through 30 document measurements made of the first exemplar cable. The measurements were taken of the cables outer diameter at the failed end. The measurements reveal that at the failed end the cable has an outside diameter of about .42 inches. Away from the failed end the cable has an outside diameter of about .32 inches. Thus, the cable swelled. Further, the swelling is more pronounced toward the failed end of the cable. The swelling observed is due to the growth of corrosion caused by rusting.

Photographs 32 and 33 are views of the non-failed end of the cable. The photographs reveal that the green painted, yellow coating extends to within about 1/64 of an inch to the swage fitting. Further the photographs reveal the presence of rust. A magnet was utilized to verify that the cable and fitting materials were steel and not stainless steel.

Photographs 34 through 38 are close-up views of the failed end of the cable as viewed looking edge on, down the cable axes. The photographs reveal that the cable is severely rusted. Further inspection of the cable revealed that the failure is consistent with a corrosion induced failure, which will be discussed later in this report. The presence of the swelling observed as noted above confirms this failure mode.

Second Exemplar Cable

Photographs 39 through 44 are various views of the second exemplar I inspected. Photographs 41 through 43 reveal that the cable is not rusty. Further, a magnet was utilized to determine that both the cable and fitting material were stainless steel.

Examination of photographs 42 through 44 reveal that the cable coating is clear in color. Further examination reveals that the stainless steel cable can be readily viewed for inspection purposes through the clear coating.

E. ANALYSIS

Engineering principles applied

In reviewing this case, a number of design and engineering standards of care are pertinent to my analysis that Hanes and CCI not only breached the standard of care, but released their products on the market without sufficient testing and continued to sell their products in the marketplace without required knowledge as to its useful life. Further, there are a number of maintenance standards of care that are pertinent to my analysis that Allied not only breached the standard of care, but released the product under their control to unsuspected users without sufficient testing and continued to use the products in the marketplace even after actual notice of defects.

In general the design, engineering, and maintenance principles that were violated by Hanes include:

a. A manufacturer has a duty to anticipate usage problems, even absent specific notice of problems.

b. Upon actual notice, if the manufacturer fails to address usage problems by warnings, re-writing instructions or design, the manufacturer's behavior is improper.

c. Proper engineering design requires that hazardous conditions be designed out of the product if feasible, and if not, then guarded or warned against.

d. The manufacturer's duty in designing a proper product necessarily includes taking into account the instructions and warnings that accompany that product, as well as the mode of distribution of those instructions and warnings. Proper design of a product requires proper functioning of the instructions and warnings in conjunction with that product. A product's design defects cannot be analyzed without taking into account the accompanying instructions and warnings. Accounting for the accompanying instructions and warnings prior to the first sale is required in determining reasonable expected use.

e. Developing instructions and warnings that meet the standard of care necessarily requires ensuring that the instructions and warnings will reach the consumer through the chain of distribution. A manufacturer cannot assume that instructions not permanently affixed to the product will reach the consumer. Warnings must be conspicuous and designed to last the life of the product. Proper product design requires a designer be competent in the standards for proper communication of necessary instructions and warnings, or the product, instructions, and warnings must be reviewed by someone that is.

f. If the instructions and warning accompanying a product are defective, the product is defective. Further, if the instructions and warning are nonexistent the product is defective.

g. The standard of care for product designers does not allow for the initial testing of instructions in the market place. This testing should be performed, and problems should be corrected, before the product is ever introduced in the market. It is the designer or manufacturer's duty to perform pre-market testing of the product in conjunction with its instructions and warnings before releasing the product into the market. Once the product is in the market, the manufacturer's duty continues. The manufacturer must have a system to track problems with the product or instructions, to review all information received regarding use and misuse of the product and to appropriately respond to safety problems by re-designing the product, re-writing the instructions or creating warnings to ensure its safe use in the marketplace.

h. It is not permissible for a manufacturer to rely on consumers to provide necessary instruction and warnings to the user where those instructions and warnings are essential for safe use of a product. The manufacturer should anticipate retailer, consumer and user confusion and mis-instruction. For that reason, it is essential that the designer of a product incorporate instructions and warnings necessary for safe use into the product itself, and develop a mode of distribution that ensures those instructions and warnings reach the user. Where a manufacturer has provided no hands-on training to a dealer, consumer, or user, that manufacturer can expect nothing in terms of the instructions that the dealer/consumer may or may not provide to it's users. A manufacturer cannot expect a dealer or consumer to provide users with essential instructions and warnings that the manufacturer has not provided to the dealer/consumer.

l. That a defective product has only caused property damage and not physical injury is not an excuse to deny the existence of a defect. The responsibility is on the manufacturer to anticipate dangers flowing from the defect and property damage is a telltale predictor of the danger of physical injury.

j. That it is the absence of adequate warnings and instructions that dictates that the defective conditions be designed out or guarded against.

k. That a manufacturer of an engineered product has a duty to properly consider safety as ANSI writes[1]:

> 8.2.4 In addition to customer needs, the designer should give due consideration to the requirements related to safety, environmental and other regulations, including items in the company's quality policy which may go beyond existing statutory requirements.
>
> 8.2.5 The quality aspects of the design should be unambiguous and adequately define characteristics important to quality, such as the acceptance and rejection criteria. Both fitness for purpose and safeguards against misuse should be considered.

l. Engineers and designers should properly analyze technical developments and their application to their particular industry in order to determine if :

1. The new technology may eliminate a hazard.
2. New technology may eliminate risk associated with accidents.
3. New technology will enhance safety-critical features or assemblies.
4. New technology may be inherently safer.

m. When a firm learns of a safety critical product enhancement, a special effort must be made to not only inform dealers, consumers, and users, of older product, steps must be taken to make that product safe. Further, the company must instruct dealers, customers, and users of the available product improvement, the hazard it eliminates, how to incorporate it, and the hazards of not upgrading.

n. When it is determined that a substantial performance or safety problem exists, notification should be utilized in conjunction with actual field modification of the product itself. The procedure should include:

1. Notification in writing with a product hazard letter as stated above. The company should notify dealers and users by telegram or by certified mail so that the letter is not confused with junk mail and or advertisement and discarded. The message should clearly state the action needed to be taken such as; discontinue use, repair, replace, and so on.
2. Providing dealers and consumers with replacement parts for the program.

3. Develop a plan for evaluating the effectiveness of the notification program, by utilizing available resources such as field service personnel and check-off reporting:

   a. Field personnel including those that provide spare or replacement parts work closely with consumers and users and should be utilized to convey and collect information, such as unsafe practices; unsafe conditions observed; availability of safety device; new literature; apply new safety signs, instructions, and warnings to older machines; upgrade older machines with new devices; and provide safety assessments with service reports; effect consumer and user awareness with both written and verbal information with confirmation in writing.

   b. Check-off reporting should be used to determine the current status of any machine or facility where machines are being serviced. The report should include product identification and the status or presence of safety related items. This report can then be utilized to identify the location of otherwise difficult consumers and users.

o. Manufacturers of products have a duty to design equipment to fail safely. This duty not only includes the actual failure of a component with the product itself but should also include modes of failure of the product to perform its intended function. When a product has an operation characteristic that creates a window of danger or failure mode that could prevent the continued use of the product the manufacturer should make the window of danger or failure safe for users.

p. Manufacturers of products have a duty to design safety devices to outlast the foreseeable life of the product the safety device is designed in conduction with. Further, if the safety device requires maintenance it is the manufacturer's duty to warn and instruct users of the necessary requirements.

q. The Federal Highway Administration (FHWA) requires an annual minimum periodic inspection, which does not form the basis for a PM program. It is merely a once a year requirement that the vehicle meet a set of requirements at the time of inspection. It is not an indication that a vehicle once inspected is safe and sound for part of or the entire upcoming year. The FHWA inspection is one primarily for functionality. It's

not intended to encompass a structural evaluation of the trailer. Further, FHWA under 49 CFR 396.3 requires that:

> Every motor carrier shall systematically inspect, repair, and maintain or cause to be systematically inspected, repaired, and maintained, all motor vehicles subject to its control.

r. Motor carriers are required, by the Federal Motor Carrier Safety Regulations to keep vehicles under their control systematically inspected, repaired, and maintained. The minimal requirements are covered under 49 CFR 396 Parts .1 & .7, and Parts .3, .5,and .17, to .25. The motor carrier is also responsible for ensuring that the driver inspections are properly completed and that drivers are properly trained and "conversant" with all the Parts of the applicable FMCSRs396. The regulation states:

> **§396.3 Inspection, repair and maintenance.**
> (a) **General** – Every motor carrier shall systematically inspect, repair, and maintain, or cause to be systematically inspected, repaired, and maintained, all motor vehicles subject to its control.
> (a)(1) Parts and accessories shall be in safe and proper operating condition at all times. These include those specified in part 393 of this subchapter and any additional parts and accessories which may affect safety of operation, including but not limited to, frame and frame assemblies, suspension systems, axles and attaching parts, wheels and rims, and steering systems.
> (a)(2) Pushout windows, emergency doors, and emergency door marking lights in buses shall be inspected at least every 90 days.
> (b) **Required records** – For vehicles controlled for 30 consecutive days or more, except for a private motor carrier of passengers (nonbusiness), the motor carriers shall maintain, or cause to be maintained, the following record for each vehicle:
> (b)(1) An identification of the vehicle including company number, if so marked, make, serial number, year, and tire size. In addition, if the motor vehicle is not owned by the motor carrier, the record shall identify the name of the person furnishing the vehicle;
> (b)(2) A means to indicate the nature and due date of the various inspection and maintenance operations to be performed;
> (b)(3) A record of inspection, repairs and maintenance indicating their date and nature; and
> (b)(4) A record of tests conducted on pushout windows, emergency doors, and emergency door marking lights on buses.
> (c) **Record retention** – The records required by this section shall be retained where the vehicle is either housed or maintained for a period of 1 year and for 6 months after the motor vehicle leaves the motor carrier's control.

These are among the design principals that I have always designed, and operated by and that all engineers are instructed to utilize where safety is paramount. It is interesting to note that not only are these principles discussed in great detail by the National Safety Council, which states [2]:

> To achieve continuous improvement in safety and health, companies must examine the interaction between people and the physical structures in which they work. Designing for safety is a strategy that incorporates a consideration of safety features in all aspects of the workplace environment.

The NSC established a design priority that companies should follow and apply to all design and redesign processes:

First Priority:	Design for minimum risk. (Eliminate hazards)
Second Priority:	Incorporate Safety Devices. (Protective safety design features)
Third Priority:	Provide warning devices. (Warn personnel)
Fourth Priority:	Develop and implement operating procedures and employee training programs. (Train personnel)
Fifth Priority:	Use Personal Protective equipment.

The NSC states that many design situations require a combination of the five priorities but that:

> Companies should not choose a lower level of priority until they have exhausted the practical applications of the higher priority levels. First and second priorities are more effective in safeguarding workers and creating safe systems because they reduce the risk by design measures that eliminate or adequately control the potential of an incident occurring and the severity of its consequences.

The NSC states that 3rd and 4th priorities rely on level of skill of the personnel. Thus, they rely on human intervention and interpretation.

Also the NSC feels that designing safety into equipment is the company's safety professional(s) role due to the fact that designing for safety is not mandatory for many pieces of equipment and operations. The NSC writes:

> Although there are numerous standards, regulations, specifications, design handbooks, and checklists that establish the minimums for specific design subjects, no specific standard clearly describes the principles to be applied in

designing for safety and the goals to be achieved. The safety practitioners must work to make safety in design part of the company's philosophy and standard operating procedure.

The NSC discusses Proactive versus Reactive design:

> Does a work system encourage employees to take dangerous shortcuts or force them to engage in risky behavior?

And:

> How can a piece of equipment be misused or malfunction, encourage unsafe behavior? Such questions can reveal inherent flaws or hazards that can be corrected by instituting safer designs.

The NSC states that the purpose for having Procedures for Design and Equipment Review is:

> To provide operations, engineering, and design personnel with guidelines and methods to foresee, evaluate, and control hazards related to occupational safety and health and the environment when considering new or redesigned equipment and process systems.

And:

> The design stage offers the greatest opportunity to anticipate, analyze, eliminate, or control hazards.

Shigley and Mischke in their Standard Handbook of Machine Design also discuss the engineering principals in great detail, which is authoritative in the field of engineering on these issues. Shigley writes [3]:

> A designer cannot effectively operate in a vacuum, but must know, or be able to discover, information affecting the design, such as the state of the art, the custom of the industry, governmental regulations, standards, good engineering practice, user expectations, legal considerations (such as product liability), and legal design requirements.

With regard to design criteria, Shigley writes:

> Although the general criteria used by a designer are many, the following list addresses almost all concerns:
>
> Function
> Safety
> Reliability
> Cost

Manufacturability
Marketability

With regard to safety Shigley writes:

> Safety This is associated with all modes of product usage. In providing for safety, the priorities in design are first, if possible, to design the hazards out of the product. If this cannot be done, then shielding and guarding should be provided so that operators and by standards cannot be exposed to the hazard. Otherwise, if a risk-benefit analysis shows that production and sale of the machine are still justified (and only as a last resort), effective warnings should be given against the hazard present. Even though warnings are the least expensive and easiest way to handle hazards in the design process, there has never been a warning that physically prevented an accident in progress. Warnings require human action or intervention. If warnings are required, excellent reference sources are publications of the National Safety Council in Chicago and a notebook entitled Machinery Product Safety Signs and Labels.

And,

> The ASME Code of Ethics says: "Engineers shall hold paramount the safety, health and welfare of the public in performance of their duties." This consideration is not new. Tacitus [10.2], about the first century A.D., said: "The desire for safety lies over and against every great and noble enterprise." Even some 2000 years earlier, the first known written law [10.2], while not specifically mentioning safety, clearly implied a necessity for a builder to consider safety.
>
> The National Safety Council [10.3] says:
>
> > Each year, accidental deaths and injuries cost our society in excess of 399 billion-in the United States alone. This figure includes lost wages, medical outlays, property damage and other expenses. The cost in human misery is incalculable. Accidents are the fifth leading cause of death. The council believes that accidents are not just random occurrences but instead result mostly from poor planing or adverse conditions of the environment in which people live, work, drive, and play. In our view, "accidents" nearly always are preventable-as are many illnesses.

Further, incorporating safety and safeguards in the design of machines is discussed in the text book "Industrial Safety" [4]:

> Machine builders in general have incorporated into their current models many safeguards that a few years ago were entirely lacking.

And,

> Finally, guards are not makeshift and should not be considered as such. They are designed and built for but one purpose- to protect against a hazard which might cause an injury; and no trouble or expense should be spared in making guards the best that can be made. If the abilities of competent designers are brought to bear on the problems of safeguarding machinery, improvement will be rapid. Anyone who compares the excellence of modern machine design, from the standpoint of effective machine functioning, with that of machine safety, will be impressed by the fact that safety is often treated as though it were of secondary importance. The safety of those who work with our machines must receive more consideration from those who build them.

With regards to mechanical guard requirements Smith notes [1]:

> It must be properly mounted. The mounting must be rigid to prevent objectionable rattles or interference with working parts. The mountings should be strong enough so that they will not fail under use.
>
> It should be easy to inspect, and a periodic checkup program, as part of the maintenance procedure for shop equipment, should be established in order to continue its effectiveness.

With regards to guarding safety hazards Smith writes:

> Fixed guards should be used wherever possible, since they provide permanent protection against hazardous machinery components. Adjustable guards are used when the mode of operation of the machine is expected to change and adjustment will be necessary to accommodate a new set of dimensions. Once adjusted, the guard should function as a fixed guard. Interlocking guards prevent operation of the machine until the guard is moved into position, which keep the worker out of the hazardous zone. It is essential that the guard put the machine in a safe mode if the guard should fail for any reason.

Products such as the incident safety device should be designed to fail safely. Smith writes:

> Fail-safe Designs. Product failures produce a significant fraction of accidents. Fail-safe design seeks to ensure that a failure (1) will not affect the product or (2) will change it to a state in which no injury or damage will occur.
>
> 1) Fail passive designs reduce the system to its lowest energy level. The product will not operate until corrective action is taken, but the failure-initiating hazard will cause no further damage. Circuit breakers are a good example of fail passive devices.

2) Fail-active designs maintain an energized condition that keeps the system in a safe mode of operation until corrective action can be taken or the system is replaced by an alternate system. Redundancy using standby equipment is an example of a fail-active system.

3) Fail-operational designs allow safe continuation of function until corrective action can be taken. Fail-operational is obviously preferred, if possible. The ASME requires fail-operational feedwater valves for boilers. Water must first flow under, rather than over, the valve disk. If the disk is detached from the valve stem, water will continue to flow and allow the boiler to function normally. Designs *should be made fail-safe to the greatest degree possible.*

With regard to product warnings Hunter writes [5]:

> Designers must realize that products which lack adequate warnings or proper instructions can be legally held to be defective, even though they perform their intended function in an exemplary manner.

Further, Hunter writes that if a warning is used:

> The warning should indicate both what the hazard is and how to avoid it.

With regard to warnings the NSC writes [6]:

> Warnings must clearly describe the possible consequences, especially personal injury, of not heeding the warning, particularly when the consequences are not obvious.
>
> When safety procedures are not obvious, warnings must clearly inform the user what to do or what not to do to avoid injury.
>
> Warnings must identify all hazards that are not obvious.
>
> The sign or label must be located on the product so the warning is conspicuous.
>
> The sign or label must be constructed so it is visible and lasts for the intended life of the product.

Department of Transportation

The Federal Highway Administration's Bureau of Motor Carrier Safety published their 1974 study of truck related personal injury study which states [7]:

> The Federal Highway Administration's Bureau of Motor Carrier Safety has conducted a survey of vehicle related slip or fall type injuries in the trucking industry.

And:

> Results
>
> Slips and falls accounted for 14% of all driver personal injury accidents and 9% of all carriers' personal injury accidents.
>
> Approximately 54% of slips and fall incidents happen on the tractor or driver area and 46% happen on the trailer or cargo area.
>
> With the exception of auto transporters, which had higher incidence rate, the other 3 types of carriers had about the same rate for slips and falls per million vehicle miles, slips and falls per dispatch and slips and falls per drivers employed.
>
> Auto transporters had higher incidence rate of slips and falls per million driver man hours and higher medical and lost time costs than the other three. As could be expected the majority of injuries for the auto transporters occurred in the cargo area.

The Federal Highway Administration also stated [4]:

> The purpose of the rulemaking is to reduce the number of accidental injuries to drivers who slip and fall while performing such tasks as connecting air and electrical lines between truck tractors and semi trailers, entering or leaving cabs, and walking or climbing upon trailers, semi trailers, and cargo for the purpose of loading, unloading and inspecting cargo.

And:

> A particular troublesome problem is slips and falls from walkways and footholds designed or intended to be used by drivers and others during loading, unloading, and inspection of cargo. The problem seems to be most severe in the case of trailers and semi trailers used to haul automobiles and tank vehicles used in the solid bulk and liquid bulk hauling industries. The largest percentage of driver slip-and-fall accidents seems to occur in these categories of operations.

The Known Hazard of Falling

Over the last 50 years, accident statistics, including statistics contained in virtually every issue of Accident Facts published by the National Safety Council, indicate that excluding motor vehicle related accidents, the major cause of accidental deaths and serious injuries in the United States is fall type accidents. About 14 thousand people are killed each year as the result of falls, and countless numbers are injured. Falls are a major source of injury in the workplace, and a significant number of these falls are related to falls from workplace related vehicles.

In a 1980 California study of trucking industry work injuries, the category of "falls" constituted 16.1 % of all injuries. According to the occupation of those injured in falls, 19.9 % occurred to "truck drivers" and 14.0 % occurred to "delivery-men and route-men." According to the source of injury on those injured by falls, 82.0 % were related to "working surfaces." (National Safety Council, Accident Facts, 1982.)

As stated in a 1974 study (published in 1977) conducted by the Federal Highway Administration's Bureau of Motor Carrier Safety of the State of California statistics related to slip and fall type injuries in the trucking industry, slip and falls accounted for 14% of all driver injury accidents and 9% of all carrier's injury accidents, with 54% of such slip and fall incidents occurring on the tractor or driver area and 46% occurring on the trailer or cargo area.

In a special study conducted in 1971 by four motor carriers, at the request of the Federal Highway Administration's Bureau of Motor Carrier Safety, the following information on slips and falls was reported: The total number of driver injuries was 1,667. Of this total (1,667), 334 (20.0%) involved slips and falls, and of these, 55 (16.5%) involved cab entry/egress falls, 31 (9.3%) involved behind tractor coupling/uncoupling falls, and 248 (74.3%) involved loading or cargo related falls. Of the 55 cab entry/egress falls, 13 (23.6%) involved automobile carriers, 3 (5.5%) involved dry bulk carriers, 34 (61.8%) involved general freight carriers, and 5 (9.1%) involved bulk liquid carriers. Of the 31 behind tractor coupling/uncoupling falls, 10 (32.3%) involved automobile carriers and 21 (67.7%) involved general freight carriers. Of the 248 loading or cargo related falls, 110 (44.4%) involved automobile carriers, 135 (54.4%) involved general freight carriers, and 3 (1.2%) involved bulk liquid carriers.

The hazards of slips and falls from vehicles, including those that haul autos such as the incident vehicle were clearly understood to the industry.

Due to the generally reduced size of "walking surfaces" utilized to access industrial equipment operator and vehicle work positions, and the typical vertical movement of the body in such situations, it is vital to give special attention to the design of proper handholds and footholds in terms of size, location, orientation, and friction (slip resistance) characteristics, in order to maintain balance and stability during vehicle access and to prevent falls.

Wire Rope

With regard to wire rope United States Steel (USS) writes [9]:

> The widespread use of wire rope in almost every type of industry-and the many ramifications and variations of such service –requires constant and up-to-date knowledge of every technical advance pertaining to the construction of wire rope and to its application. To make available such information to engineers and to others who have need for exact facts relating to the subject-is the purpose of this Handbook. It is our belief that you will find the contents not only of very real help-but that you will recognize in it a broadness of scope and a completeness that could only result from knowledge gained through many years of leadership in this important field. This leadership has been achieved because of steadfast adherence to unvarying standards of quality-and because of ability to provide a perfect answer to many usual and unusual applications problems that are constantly occurring. In the future-as in the past-the vital factors that have made us the world's largest manufacturers of wire rope.

With regard to Lubrication USS writes:

> The importance of periodical lubrication is apparent from the fact that a wire rope is a machine with many moving parts. Each time a rope bends or straightens the wires in the strands and the strands in the rope must slide on each other. This requires a film of lubricant on each moving part.
>
> A second important reason for lubricating iron and steel wire ropes is to prevent corrosion of the wires and deterioration of the fiber core. There is no known means of inspection, which will even approximate the strength of a corroded rope. A rusty rope is a liability.
>
> Used ropes should be cleaned before they are lubricated.

With regard to Galvanized wire ropes, USS writes:

> Galvanized ropes have the individual wires protected by a uniform coating of pure zinc. These are used where ropes are exposed to weather, to moisture, or to other corroding agencies, and their field is usually limited to stationary installations such as guys, standing rigging, towing hawsers, mooring lines, and the like. Heavy lubricated bright ropes are generally preferred to galvanized ropes on hoisting equipment, where corrosive conditions prevail.

With regard to stainless steel wire ropes:

> Corrosion-Resistant Steel is the latest addition to the metals used for producing wire ropes. The 18 percent chromium, 8 percent nickel alloy commonly known

as "18-8" has filled the need for a corrosion-resistant wire rope for both marine and industrial use.

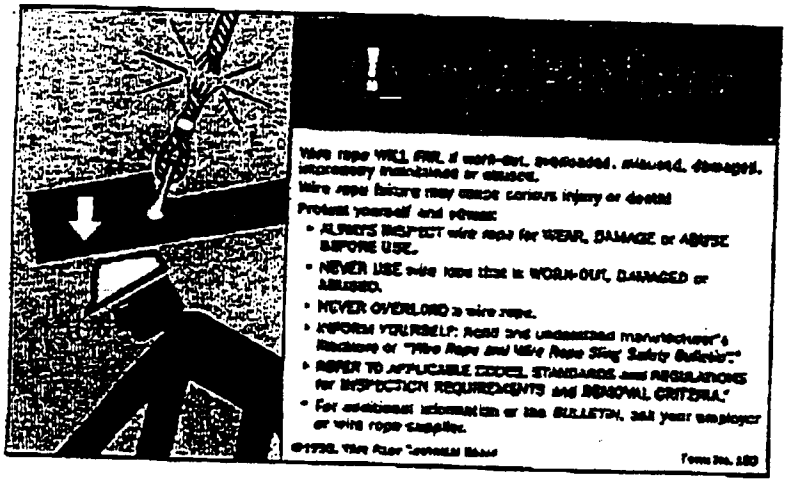
With regard to wire rope safety, Gator Supply Company writes [10]:

> WIRE ROPE IS A MACHINE. Understand and respect it.
> Like any machine, it needs proper care and maintenance for optimal safety and long service life. For a better understanding of wire rope we highly recommend the Wire Rope Users Manual by the Wire Rope Technical Board.

And:

> Use inspection instructions as guidelines only. Additional technical information on wire rope inspection can be obtained. Two of the most important prerequisites for inspecting wire rope are technical knowledge and **experience.**
>
> Check the general condition of the wire rope. Also, look for localized damage and wear, especially at wire rope attachments. Inspect all parts that come in contact with the wire rope. Poor performance of wire rope can often be traced back to worn or wrong-sized sheaves, drums, rollers, etc. Look for kinks, broken wires, abrasions, lack of lubrication, rust damage, crushing, reduction of diameter, stretch or other obvious damage. If **any** of these conditions exists or if there is any other apparent damage to the wire rope, retire the wire rope according to the instructions below.
>
> When in doubt about the extent of the damage, retire the wire rope in question immediately. Without laboratory analysis, it is **impossible** to determine the strength of damaged or used wire. Thus, you will not be able to tell whether wire rope with any amount of damage is safe to use. Retire the wire rope that is damaged. For specific inspection procedures check various OSHA and ANSI publications.

The Associated Wire Rope Fabricators is the association that sponsors the Wire Rope Users Manual, and the Wire Rope Technical Board. The Association supplies the following warning, which appears in color in figure 1 [11]:



The warning is dated 1993, by the Wire Rope Fabricators.

With regard to lubrication the WRCA writes [12]:

> **Lubricate ropes often for long life.** To properly maintain your rope, the first place to check is for obvious signs of abuse from other parts of the rope system. But the biggest part of maintenance involves regular lubrication to reduce friction between the rope's components as well as the friction between rope and sheaves or drums.
> Your rope receives internal lubricant at the factory, but it's not enough to last the rope's entire life due to constant bending over sheaves and drums. The need to keep your ropes properly lubricated can't be emphasized enough.
>
> **Clean ropes first.** Remove excess dirt, rock, dust or other materials that can prevent field-applied lubricants from properly penetrating into the ropes.

With regard to rope inspection, removal and possible causes, Unirope writes [13]:

Fault	Possible Cause
Corrosion	Inadequate lubrication, Improper storage, Exposure to acids or alkalis.

And:

Wire Rope Inspection
An inspection should include verification that none of these removal criteria are met by checking for such things as:

Surface wear, normal and unusual
Broken wires: Number and location
Reduction in Diameter
Rope stretch (elongation)
Integrity of attachments
Evidence of abuse or contact with other objects
Heat damage
Corrosion

With regard to Galvanized Cable, in particular 7x19(the incident size), Unirope writes:

These small diameter cables are made from carbon steel and are drawn galvanized. If used outdoors, the galvanizing protects the cable from corrosion for a period of time but will discolor to a white or dull appearance. Prolonged exposure to the elements will eventually cause corrosion.
Cables which are required to be coated and which are subjected to sheaves and pulleys should be made with a hard Nylon coating instead of the relatively soft PVC coating. Ask for details.

Further they provide the following warning again relevant to Galvanized Cable, in particular 7x19:

CAUTION
DO NOT use these cables
in any aircraft or similar
application

Corrosion Failures

A preventive maintenance program is essential for the safety of a safety cable assembly throughout its entire service life. A failure in a component of this assembly will often lead to the complete failure of the assembly. An adequate preventive maintenance program will require that all componentry in the safety cable and rail connection, including the bolting, be visually inspected and repaired or replaced if necessary.

To this subject DAS writes [14]:

> Services failures are not uncommon due to abnormally severe conditions of speed, loading, temperature and chemical environment. Absence of scheduled maintenance, inspection and monitoring are the causes of such failures. There are different types of deterioration associated with the failure system and these are given below.
>
> | Defect | Effect |
> |---|---|
> | Wear-adhesive and abrasive type | Causes dimensional deviation, introduces stress-concentration and susceptibility to fatigue. |
> | Corrosion-oxidation, pitting and and intergranular corrosion | Causes dimensional deviation stress concentration and reduces strength and fatigue resistance. ..... |
> | Inadequate/bad maintenance and improper repair. | Results in premature failure or undetected defects during overhaul. |

Trailers are commonly subjected to the severe conditions of repeated loading, roadway vibration, and chemical attack from chemicals and moisture. The deterioration of the safety cable to swage fitting joint takes time. Photos reviewed reveal rust on the trailer body and it's underside. As the trailer ages, the effects of time and use require increased preventive maintenance.

Allied Safety Meetings

A review of safety meeting minutes and internal documents reveals the following comments with regard to Allied's knowledge with regard to safety cable problems.

1) 3/11/1999 - Will bring up cable issues on 3200 equipment.

2) 3/30, 3/31 - What is the policy on replacing the "clothes-line"?

3) 4/13/1999 – "clothesline" will be replaced as requested. All drivers should check their's, and if the plastic is cracked or there are any signs of rust, have them replaced.

4) 4/12/1999, 4/29/1999, 4/30/1999 – Check your clothes lines. If you see any problems (plastic pulling away, rusting, etc) have them replaced. If you are not sure, have Bill or the shop check them.

5) 5/18/1999, 5/19/1999 – One driver shopped truck for clothesline replacement and we were out. (We can get extra from Marion.)

6) 9/7/1999 – Moraine will be a test site for new "chain" clothesline to be used on the head ramp. The chains will be adjustable, and should eliminate the problems we've had due to weakened cables. Phil Kuchar suggested that all trucks be refitted.

7) 9/21/99, 9/24/1999 – We had previously announced we would be a "test site" for the new safety chains for the head ramp. This issue has been placed on hold for the time.

8) 10/13/1999 – Clotheslines will not be retrofitted onto trucks. We will continue to replace them as required.

9) 9/7/2000 - inspecting and replacing as needed per Gordon will speak to B. weaver Rick said he only replaces what Bill tells him to. They (he) does not inspect for problems.

10) 9/30/2000 – A discussion was brought up on the replacement of safety cables for trucks. The shop is actively replacing all safety cables as they become available.

Prior Incident

The Ferguson incident is not the first notice to Allied that driver's were being injured from falls related to a failed safety cable. Thomas Fay had a fall with circumstances similar to that of Ferguson on 8/8/2000. The Employee Statement of Accident/Injury for the Fay incident reads:

> I was loading my truck chaining down #1 Unit on the head ramp. Leaned on the safety cable for balance while chaining. Cable snapped + I went flying off the head ramp to the black topped driveway, approximately 8 to 9 feet below.

Deposition Testimony of Richard Shivley

Shivley testified that he was a mechanic at Allied. Further that he knew that the safety cables were failing at the point where the cable goes into the swaged fitting. Shivley testified:

A. Where the braiding goes into the swedging.

Q. That's where they would break?

A. Yes, sir.

Q. Okay. And what period of time did you replace these six that were broken?

A. I was on a voluntary layoff for a while. I came back to work to the Moraine facility in May '99.

Q. Okay.

A. And they were replacing them at that time, during that summer, I remember.

Shivley Pg. 9

Shivley testified that he could not swear to the replacement of safety cables into the year 2000.

With regard to the fact that all the cables need to be replaced, Shivley testified:

Q. Who was it that told you that they all needed replacing?

A. I would say Bill Weaver.

Shivley PG. 31

Shivley testified that he did not receive any instruction or training with regard to the maintenance of the safety cables. Further Shivley testified:

Q. Mr. Winter asked you whether you received any instructions from outside of the company about how to maintain the cables like this. You said there weren't any. Do you consider it good practice as a mechanic with 25 years' experience to do something to maintain, protect or replace galvanized parts that are exposed to the elements?

Mr. Larson: Objection to form.

A. No, sir.

Q. Are you aware that galvanized parts may deteriorate and reflect out in the elements?

Mr. Larson: Objection to the form.

A. No. sir.

Shivley Pg. 37

Deposition Testimony of Fredrick L. Wolf

Wolf testified that he was a mechanic at Allied. With regard to the replacement of safety cables, Wolf testified:

Q. ... First of all, were all the safety cables being replaced on all of the trucks?

A. I'm not sure. There was no policy that I know of. I mean, we were replacing them as they came in.

Wolf Pg. 9

And:

Q. Let's imagine they were in stock. If four came in that day, that truck sitting there, you're working on something, you replace all four cables?

A. Yes, before we release the truck, as per instruction of my boss.

Wolf Pg. 10

Wolf testified that they were just replacing cables on trucks that happened to be in the shop for other maintenance and only if they had cables to use. To this point Wolf testified:

Q. Now if you didn't have enough for four, any particular order you used to replace them? Did you replace top ones, bottom ones, or anything like that?

A. To my recollection, we were instructed to replace top ones if we only had two.

Wolf Pg. 32

Deposition Testimony of William C. Weaver

Weaver testified that he was the maintenance manager at the Moraine facility of Allied. Weaver testified that in January, February of 1999, by way of conference call between the maintenance managers and a Mr. Tagget, the maintenance managers in Indiana, Michigan and Ohio were ordered to replace all safety cables specifically because they were breaking. Further, Weaver testified that they were told to do this right away. With regard to the conference call with Tagget, Weaver testified:

Q. And so he said we have a cable problem?

A. Yes, sir.

Q. Did he say what the problem was?

A. Yes, sir.

Q. What did he say?

A. He said there was a rust problem on a cable between the plastic and the joint and fixture, at the crimp, and that we were to replace. And when we took the old ones off, we were to cut them up, destroy them, put them in the trash so they would not be reused.

Q. So you were to replace them all?

A. Yes, sir. There wasn't any question about it, we replaced them.

Weaver Pg.'s. 13 &14

And:

Q. Okay. And so up until August and at least September 2000, some of the trucks had still not had new cables put on them, correct?

A. I don't know about the other installations. Mine was taken care of.

Q. But Mr. Ferguson still had an old cable on it, correct?

A. I - - according to these pictures, yes.

Weaver Pg. 19

With regard to inspecting for any problems, Weaver testified:

We were not inspecting. The driver would tell us. We did not just go, per se, and inspect and say, well, that's a bad cable. We were instructed to replace. That's what we did when we had the cables to replace them with.

Weaver Pg. 20

Weaver testified that if they did not have sufficient cables to completely change all four on a single vehicle that they would change out the bottom ones:

That's because they are in a cross-position when they are working up there.

Weaver Pg. 34

Weaver testified that he had seen stationary handrails on other equipment.

With regard to retaining incident parts Weaver testified:

Q. So it's standard procedure, proper procedure to hold the parts that were involved in an accident?

A. Yes, sir.

Weaver Pg. 40

Deposition Testimony of William C. Hanes

Hanes testified that he was the owner of Hanes Supply Inc. Further that he was involved in the sales of the initial cables to CCI.

With regard to the cable specifications Hanes testified that:

I told them what was available. It was - - it was up to their call.

Hanes Pg. 26

And:

It was their choice. They were - - it's their choice to utilize the material they felt was appropriate.

Hanes Pg. 44

Further, Hanes testified that CCI, not Hanes, chose the specification for the swaged fitting, the material specification, and the coating for the material. Hanes testified:

Q. Okay. To your Knowledge, did anyone at your company give them advice or recommendation on what type of material to use, what coating to use, what diameter to make the safety cable, whether it be PVC, nylon, galvanized steel, stainless steel? Did anyone in your company make a recommendation to them?

A. No.

Hanes Pg. 46

Finally, Hanes testified that at about 1999 CCI changed the design of the safety cable to a thimble and threaded eyebolt.

With regard to the life of the product, Hanes testified:

Q. Okay. Did you know how long these safety cables were supposed to last?

A. No.

Q. Did you give them any instructions on replacement of them?

A. The instructions would be the standard warnings on our work order invoices.

Hanes Pg. 47

The warning reads:

Product Warning: Wire rope products, slings and lifting equipment will break if abused, misused or overused. Regular inspection and maintenance before and after use is necessary. Consult industry recommendations and standards before using.

With regard to problems with the product, Hanes testified:

Q. Okay. The only thing at issue is the wire itself?

A. I don't think the wire itself. The wire is fine. Got to be inspected.

Q. But it's my understanding that you didn't tell the people at Commercial Carriers, Inc. anything about inspecting the cables, other than your one warning on your invoice, correct?

A. We have the warning on there, and the end user has to take it upon themselves if he sees corrosion or some type of deformation in the product to remove it from service.

Q. Okay. And you didn't give them an opinion as to how long the product would last?

A. No.

Hanes Pg.'s 67 & 68

Hanes testified that he was aware that the product safety cables were to be utilized on trucks. Further, when asked if he would recommend this material if he knew the product had a 10-year life, Hanes testified:

A. I would - - would - - you know, based on that, a ten year life span would be pushing the window for galvanized.

Q. You - - you would say - - what do you mean, "pushing the window for galvanized"?

A. That's - - that's a long time for any type of galvanized product to be subject to salt, corrosion.

Q. And why's that?

A. It's the chemical process that happens, the galvanizing breaking down.

Hanes Pg. 70

Hanes testified that stainless steel would have been more corrosion resistant than galvanized, and that steel that was not galvanized would have accelerated the oxidation process. With regard to the safety cable failures, Hanes testified:

Q. Okay. Are you surprised that after five to six years on these trucks their cables started breaking?

A. I'm surprised if they were maintained properly and inspected, they would have been removed.

Q. Okay. So, you're saying that if they had been maintained and inspected, they should have been removed, correct?

A. Correct.

Hanes Pg.'s 71 & 72

Deposition Testimony of Peter J. Terzian, Jr.

Terzian testified that he was the General Manager of the entire manufacturing operation at CCI.

Terzian testified that prior to the incident design, CCI had utilized the safety cables on a truck that was built for a company in Belgium and that they provided hand holds for a Canadian design. Further, Terzian testified that there was a history of fails from the vehicles, but that there were not a lot from that position.

With regard to the use of the cables Terzian testified that "Mr. Fortuna asked us to evaluate them":

Q. Okay. When he asked you to evaluate it, what did you do?

A. Well, you know, I misstated that, because, really, he didn't ask us to evaluate it. He asked us to put them on so that he could evaluate it.

Terzian Pg. 27

With regards to the implementation of the safety cables, Terzian testified:

Q. Did it come in stages? I mean, did he put ten on trucks and say, okay, that's a good idea, let's put them on them all, or did he just put them on them all and evaluate it from there?

A. It's funny you mention that, because he and I had a bit of a - - an argument about that. He said put them on them all. And I, a student of cautious evolution, I learned in the past that you do things, test them, and then do them again and then do them again and test them and then make a decision. Mr. Fortuna said, no, in this particular case he wanted them put on. And so I said okay. He's the boss.

Terzian Pg. 38

Terzian testified that the only company that CCI purchased cables from was Hanes Supply Co. With regard to the strength of the cables Terzian testified that he recalled the cable as being 7,000-pound test:

... And we were talking about a driver no heavier than 350 pounds, I would imagine, ever. But, so, really, it was - - even if you double that to 700 pounds, it was ten times safer than we felt we needed. So, we took his recommendation because he was the expert and we put them on.

Terzian Pg. 30

Terzian testified that the use of the galvanized cable was based on the recommendations of Hanes because " He was the expert":

We asked his advice.

Terzian Pg. 35

And:

Q. Okay. Was stainless steel considered at all?

A. We just went by the recommendations that Mr. Hanes or Hanes Supply came up with, you know. Galvanized seems - - aircraft cable seems to us that if the aircraft industry relied on that type of cable to maintain the safety of hundreds of people for a long period of time, it certainly would be okay for what our intended purpose was.

Terzian Pg. 52

Terzian testified that the life of the auto transporter was 10 years. Further after that the vehicle would be brought in to be refurbished completely from "stem to stern".

Terzian testified that the drawing of the cable was generated four to five months after CCI implemented the design and began receiving cables.

With regard to the expected use of the cables Terzian testified:

Q. Okay. The - - the cables were meant, though, for people to grab onto them?

A. Yes, sir, they could - - they could grab onto them, and they were being evaluated to see if, in fact, a person did slip and fall, would they prevent a fall off the head ramp.

Q. Was the evaluation ever done?

A. No. It really wasn't. I had asked a couple of times over - - oh, Mr. Fortuna, in all fairness, Mr. Fortuna was only there for like two years.

Terzian Pg. 56

Terzian testified that he was not aware of any maintenance instructions being provided with regard to the cables.

Discussion

By design, it is necessary for users of an auto transporter, such as the incident unit, to climb up onto the vehicle for the purposes of loading. However, auto transporters should be properly designed so that operators are protected against the hazards of falling. This is foreseeable. Further, auto transporters should be properly designed so that operators are protected against the hazards of premature safety cable failures a known condition that can lead to a loss of balance and/or a fall. This too is foreseeable. Thus, the auto transporters and in particular, the safety cables, must be properly designed, maintained, and be unambiguous and be adequately defined for its user, Ferguson.

That the safety cable would cause a fall due to the failure that occurred would not have been apparent to Ferguson who is neither an engineer nor a designer. Further, that the safety cable could or would fail under the incident circumstances would not have been apparent to Ferguson who has not designed an auto transporter.

Allied systems had specific knowledge that safety cable failure incidents occurred prior to the Ferguson incident. Yet, the defective condition of the incident unit was not corrected, nor was a proper inspection done to detect the defective condition. This is improper. Had a proper inspection been done, and the defective condition detected and corrected, this incident would not have occurred. The incident vehicle did have three replacement safety cables; yet, the incident cable was not replaced. This is improper maintenance in particular considering an incident similar to the Ferguson incident occurred about a month prior.

Further, testimony revealed that Hanes and CCI had specific knowledge that vehicles and components they manufactured needed to be safe with regards to failures and that their safety cables were in fact being utilized in conjunction with highway vehicles with a ten year life. Terzian testified that he had never heard of a single safety cable failure yet Hanes testified that in about 1999 CCI changed their design to that similar to the configuration found on the other three safety cables of the incident unit. None of which were shown in a failed condition on the date the incident vehicle was first photographed.

No explanation has been provided as to why the design change was made. Further absent a defective condition there would have been no reason for CCI and/or Hanes to change the design. Finally, no drawing or change notice that reflects the change has been provided.

Thus, Hanes and CCI knew that there was at least a condition related to safety cable failure that could lead to an unexpected loss of balance and/or fall, yet provided no warning or instruction with regard to what the condition is and what to do in the event the condition is encountered.

Terzian a self proclaimed student of cautious evolution failed to follow his teachings. Further, neither did he nor CCI perform any testing or evaluation to determine the validity of their design. Rather, Terzian relied on the supposed recommendations of Hanes Supply and his belief that the cable was fit for his purpose if it was fit for use in an aircraft. Yet Unirope, a wire rope manufacturer, warns that the rope is unfit for aircraft use and Hanes claims to have provided no recommendations of any type in any form.

Hanes testified that it was CCI that provided the critical design and selection criterion, yet the drawing of the actual initial component was not completed until four to five months after the safety cables were in use.

Further Terzian claims that the safety cable had a factor of safety greater than 10 based on twice the weight of his expected driver. My analysis reveals that the abrupt transition between the safety cable and the swaged fitting produces a geometric stress concentration [15]. Peterson writes [15]:

> The elementary formulas used in the design are based on members having a constant section or a section with gradual change of contour (Fig. 1). Such conditions, however, are hardly ever attained throughout the highly stressed region of actual machined parts or structural members. The presence of shoulders, grooves, holes, keyways, threads, and so on, result in a modification of simple stress distributions of Fig. 1, so that localized high stresses occur as shown in Fig. 2. This localization of high stresses is known as a stress concentration, measured by the stress concentration factor ... .

Peterson's Figures 1 & 2 are shown in my figures 2 and 3.

My analysis reveals that the transition of the cable to fitting results in a stress concentration factor of about 4. This means that the actual strength of the safety cable was at least half as strong as Terzian believed. Further, this is assuming we have an undamaged, uncorroded cable. As stated above, either condition would further reduce the cable strength and will ultimately lead to a failure as occurred in this incident.

The warning Hanes supplies on its invoice is improper and inadequate. An invoice from a component manufacturer to a vehicle manufacturer is not intended to reach consumers. Further, invoices in general are passed on to the purchasing department of the vehicle manufacturer and not to individuals involved with product safety. Thus Hanes should not assume that anyone involved with product safety from CCI ever saw the warning. Even so, the invoice does not instruct or warn operators or users with regards to proper procedures in the event that corrosion is encountered. There is no warning or instruction with regards to what to expect and how to prevent corrosion.

CCI who manufactured the vehicle provided no manual, instruction or warning of its own making with regard to inspection or maintenance, nor did they correct the defective condition that Hanes created.

Allied did not maintain the trailer in accordance with the federal requirements. A proper maintenance program would have identified the rust on the incident safety cable. Further a proper maintenance program would have identified the presence of the incident safety cable when the other three had been replaced. Based on the vehicle's age, knowledge of the failure problem, and the presence of rust, proper procedure dictates that a complete investigation be completed to determine the condition of their safety cables including that of the incident vehicle. This investigation would include, at a minimum, the removal of all suspected cables and correspondence with the vehicle manufacturer for the purpose of design resolution.

Allowing corrosion to accumulate in the joint demonstrates improper maintenance. Had proper inspections and maintenance been performed on the vehicle all corroded cables would have been removed and this incident would not have occurred. In light of the known failures, had Allied properly maintained the vehicle this incident would never have occurred.

Allied should have known that after failures began to occur that the cables needed to be properly inspected and maintained.

A proper record of all inspection and maintenance should have been kept by Allied, and was not. Further the failed components involved with this incident should have been preserved and were not.

The Maintenance practices of Allied were improper in that they were not in compliance with the Federal Regulations. Further, that the defective cable was present on the vehicle on the date of the incident when Weaver testified that all cables were to be replaced demonstrates that the proper procedure for maintaining vehicles were not being followed.

In light of the danger due to fall type incidents, the known danger of safety cable failures and it's adverse effects on vehicle safety, the confusion about when a cable is safe and when a cable should be replaced, the vehicle and in particular the safety cable, needed to be given special design attention to these matters, including:

a. Testing should have been performed to identify the ability and life of a safety cable in particular when there was no data to support either CCI's or Hanes' position that the cable was safe and proper for its intended use.

b. Warnings to consumers should have been provided identifying the dangerous period of time when the cable is not safe. Warnings and instructions should have been provided regarding how to properly inspect and maintain the cables. These warnings should have been provided in a manner designed to reach the end-user.

c. Users should have been provided comprehensible instructions for safe operation and what to do in the event a corroded cable was detected.

d. Defects in the products should have been designed out.

   i. The reduced cross sectional area observed in the incident safety cable should have been designed out.

   ii. The vehicles should have come with instructions for proper use, inspection and maintenance and warnings of the consequences of failures due to improper maintenance.

iii. The safety cable should have been designed and manufactured so as not to fail with less than the vehicles expected years of service.

iv. The safety cable should have been designed and manufactured out of stainless steel due to the corrosive nature of its environment.

v. The cable coating should have been clear colored rather than yellow so that detecting the presence of rust under the coating would have been possible.

CCI and Hanes breached the standard of care in failing to perform proper pre-market testing with regard to the safety of the vehicle design in particular the safety cable in the event corrosion occurred, the design and construction of the safety cables including warnings or instructions. Adequate pre-market testing would have revealed the following:

a. The dangers associated with corrosive failures.

b. The fact that the CCI and Hanes' position that the vehicle was safe for its intended use with the safety cables they both supplied was inherent flawed.

c. The need for a proper safety cable assembly.

d. The need for proper warnings and instructions.

e. That the Hanes warnings and instructions were defective because they did were not directed to operators nor were they proper. This is particularly troublesome in light of the fact that Hanes attributes the cause of the incident to improper maintenance, a procedure Hanes had a duty to supply and did not.

f. The auto transporter as a vehicle was defective for lack of a proper safety cable to eliminate the danger associated with failing, and a lack of instructions and warnings. Further that the unit was not fail-safe.

g. That operators needed to be warned with regard to what to do in the event that a damaged or corroded cable was detected.

h. That proper use of the product was not clear and obvious. Further, it was ambiguous to the untrained user. Particularly to a lay operator with no previous experience with cables or their inspection and maintenance as occurred in this incident.

CCI, who assembled the vehicle with the Hanes safety cables, thus creating a complete vehicle should have recognized the defective conditions created by Hanes and corrected them.

Even in the absence of prior incidents, both CCI and Hanes should have known that by not providing a proper design, instructions or warnings, from an engineering standpoint, it was foreseeable that operators would not be instructed by warnings, instructions, and/or by design on what to do in the event a corroded cable was detected. However, Allied did receive actual notice of the defects and their ill effects and failed to properly correct the defective condition created by CCI and Hanes.

It is the failure of CCI and Hanes to warn, failure to correct its instructions and the design defects on the incident vehicle that set the wheels in motion with regard to the cause of this incident.

Even though CCI and Hanes understood the dangers associated with improper cables and fall events, it is the lack of proper engineering methodology, namely testing, that prevented them from seeing the big picture and affecting the required change necessary to eliminate the defects within their product, and thus prevent incidents like the Ferguson incident.

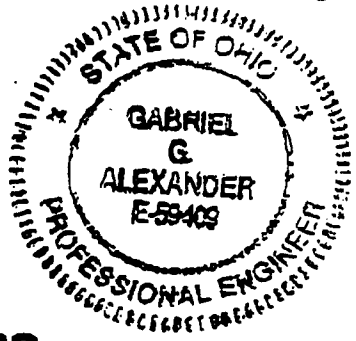
The manufacturer cannot delegate essential responsibilities for training operators to a user or customer in particular when warnings and instructions are not clear and obvious and for the most part non-existent. Further, proper operation was ambiguous to the untrained user.

E. FINDINGS

Within a reasonable degree of engineering certainty, and subject to change if additional information becomes available, it is my professional opinion that:

1. The Ferguson vehicle was defective.
2. Ferguson's actions were proper and were not a cause of this incident.
3. The Safety Cable failed during normal reasonable operation and caused this crash.
4. The incident vehicle was defective in that the Safety Cable failed during normal reasonable operation.
5. The Safety Cable was defective in that it was not corrosion resistant and failed in an area of reduced cross section in the presence geometric stress concentrations.
6. The incident vehicle was defectively manufactured without a proper Safety Cable, known available technology that should have been utilized in its design.
7. The incident Vehicle was dangerous and defective in a manner that caused Ferguson's fall.
8. Furthermore, in the absence of a proper design, which would prevent falls, warnings and instructions should have been provided with regard to required inspection and maintenance procedures.
9. Hanes' design and manufacture of the incident Safety Cable was improper and caused Ferguson's fall. Further, CCI and Allied's actions were improper in that they failed to correct the defective condition that Hanes created. Further, Allied had prior knowledge of the defective condition, and was responsible for the vehicle's maintenance, and failed to act on the knowledge and correct the defective condition that Hanes created.
10. By not properly maintaining the incident vehicle Allied, reasonably and with substantial certainty, created an unsafe work condition that would and in fact did lead to Ferguson's injuries
11. CCI's responsibility for the configuration of the incident vehicle was as great as that of Hanes as they completed the vehicle and was responsible for it's configuration.

Gabriel G. Alexander P.E.



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Robson Lapina
Forensic Engineers, Architects, Scientists
& Fire Investigators

GABRIEL G. ALEXANDER, P.E.
Mechanical Engineer

PROFESSIONAL EXPERIENCE

3/99 to present — **Robson Lapina, Inc.**
Associate, Manager of Pittsburgh Office
Provide technical investigations, analysis, reports, and testimony toward the resolution of litigation involving trucks, trailers, mechanical engineering and crash reconstruction.

1997 to 3/1999 — **True Temper Hardware**, manufacturer of lawn and garden tools
Manager of Design Engineering
Responsible for all design engineering functions including new product development, product implementation, and patent applications. Products: shovels (plastic and metal), wheelbarrows, hoes, forks, scoops, tree trimmers, and general pruning tools. Develop Failure Modes and Effects Analysis (FMEA) procedure and plan for company-wide use.

1996 to 1997 — **Trans Air Manufacturing**, air conditioning systems for trucks and buses
Director of Engineering
Responsible for all engineering functions. Products: air conditioning systems for transportation, components include compressor mountings and brackets, condenser units, evaporator units, roof top mounted air conditioning units, and rear deck mounted air conditioning units. Work included analyzing and reconfiguring truck belt drives for compressors and fans.

1993 to 1996 — **Kidron, Inc.**, manufacturer of truck bodies, trailers, fire truck and utility vehicle cabs
Manager of Engineering
Responsible for all engineering functions: Production Engineering, Product Engineering, R & D, Warranty Department, and Quality Control. Products: truck bodies and refrigerated trailers, mini trailer, drop deck trailer, step van, rear drop, and container body.

1992 to 1993 — **Stewart & Stevenson Inc.**, manufacturers of trucks and trailers
Project Engineer
Products: military and commercial trucks, trailers, truck components, a 2 ½-5 ton truck family (utility truck, tow truck, ambulance, tanker, expandable van, etc.) Design activities included: optimizing suspension components, tire size, spring rate, damping rate, anti sway bar stiffness and overall suspension geometry's; all R & M (Reliability and Maintainability) activities; brake systems, exhaust systems, and cargo beds.

09/14/00

Gabriel G. Alexander, P.E.
Robson Lapina, Inc.
404 Commerce Park Drive
Cranberry Township, PA 16
(724) 772-2244
Fax (724) 772-2256
(800) 813-6735
www.robsonlapina.com
Robson Lapina, Inc.
1420 Kanawha Blvd. East
Charleston, WV 25301
Lance E. Robson, P.E.
Ronald P. Lapina, P.E.
Lawrence C. Dinoff, A.I.A.
Linda Redding Gunter, Tre
Les Winter, P.E.
Ken W. Crowley, Ph.D., P.E.
Stephen E. Fournier, P.E.
Thomas P. Lacek, P.E.
George D. Pope, P.E.
H. Richard Hicks, P.E.
Helge Lian, P.E.
D. Hugh McLean, P.E.
Julius Pereira, III, A.I.A., P.
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Ralph H. Ridgeway, P.E.
Matthew A. Balmer, P.E.
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Dale J. Caprin, P.E.
Joseph C. Cannizzo, P.E.
Ronald Schuble, P.E., C.I.
Gary A. Dean, P.E.
Steven M. Myers, P.E., C.F.E.
Patrick McPartland, P.E.
(Tina) Turnig CTH, Ph.D.
Harry Ehrlich
Joseph D. Rudzik
Fire Investigators
Edmund G. Knight, P.I., C.F.
Brian L. Gray, P.I., C.F.I.
William T. Meyers, P.I., C.F.I.
Indianapolis, IN
Boston, MA
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Detroit, MI
Haddonfield, NJ
Morristown, NJ
Albany, NY
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Mineola, NY
New York, NY
White Plains, NY
Cincinnati, OH
Cleveland, OH
Lancaster, PA
Richmond, VA

Honerlaw & Honerlaw Co., L.P.A.
ATTORNEYS AT LAW
9227 WINTON ROAD
CINCINNATI, OHIO 45231

JOSEPH S. HONERLAW
MICHAEL J. HONERLAW

Telephone: (513) 931-2200
Facsimile: (513) 931-2229
E-mail: honerlaw@honerlaw.com

FAX COVER SHEET

To: Tom Koustmer, Esq.

From: Michael Honerlaw

Date: February 26, 2002

RE: David Ferguson

Remarks:

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Robson Lapina
Forensic Engineers, Architects, Scientists & Fire Investigators

Phone: 724-772-2244
800-319-2739

404 COMMERCE PARK DRIVE
CRANBERRY TOWNSHIP, PA 16066

FAX: 724-772-2256
WWW.ROBSONLAPINA.COM

GARRIEL G. ALEXANDER, P.E.
Mechanical Engineer

PROFESSIONAL EXPERIENCE

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02/06/02